DETAILED ACTION

1. In order to be fair to the applicant the examiner has provided this supplementary action because applicant was confused about a typographical error on the action summary sheet where both final and non-final boxes both were checked.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claim 1, 4-6, 29-30, 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti (U.S. Patent No.: 5,933,421) in view of Paulraj (5,345,599) further in view of Jenness (U.S. Patent No.: 5,373,300) further in view of Bell (U.S. Patent No.: 6,115,762)

Referring to claim 1, Alamouti teaches: in a multi-point communication system having a receiver and transmitter disposed at a primary site for communication with a plurality of remote units disposed at respective secondary sites an antenna (Figure 1 shows a Remote stations or units in communication with a Base station which has a TRANS or transmitter and receiver which are in a multi point configuration) comprising:

Multiple receiving elements configured to receive communication over a carrier frequency from said plurality of remote units disposed at respective secondary sites (A & B per Fig 1 are elements which receive communication over F2 or carrier frequency from Remote Station U and Remote Station V which are disposed at respective secondary sites)

At least two receiving elements configured to receive the communication signals on the same frequency band during any period of time (A & B per Fig 1 are receiving elements which receive F2 or communication signals on the same frequency band)

Each group containing at least one receiving element (A and B contain at least one element per Fig 1)

Spatial diversity (per Fig 1)

Alamouti does not expressly call for: the receiving elements being partitioned into a plurality of group disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Paulraj teaches: the receiving elements being partitioned into a plurality of group disposed remotely from one another and at lest another group containing multiple elements proximal to one another (Antenna or elements summed and weighted into d groups and each group has at least one antenna weighted per Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the receiving elements being partitioned into a plurality of group disposed remotely from one another Paulraj to the processing of Almouti in order to perform spatial filtering.

The combination of Alamouti and Paulraj does not expressly call for: at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Jenness teaches: disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity (spacing is minimum distance in order to achieve spatial diversity per col. 1 line 63 to col. 2 line 5)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity of Jenness to the system of the combination of Almouti and Paulraj in order to improve signal reception in a multipath environment.

The combination of Alamounti, Paulraj, and Jenness do not expressly call for: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Bell teaches: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity (separating the elements an appropriate or maximum distance in order to achieve spatial diversity per col. 3 line 53 to col. 4 line 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity of Bell to the system of the combination of Alamouti, Paulraj, and Jenness in order to insure that the elements are not separated to far which will result in degradation due to multipath affects.

Referring to claim 4, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication system of claim 1

The combination of Almouti, Jenness, and Bell do not expressly call for: wherein said multiple elements constitute and adaptive antenna array and each group constitutes a subarray

Paulraj teaches: wherein said multiple elements constitute and adaptive antenna array and each group constitutes a subarray (Antennas 1 through M are elements per Fig 5 and output of elements are mapped to Spatial Input Filter Input 1 to M and are weighted and summed into d groups per Fig 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add wherein said multiple elements constitute and adaptive antenna array and each group constitutes a subarray of Paulraj to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 5, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication system of claim 1

The combination of Almouti, Jenness, and Bell do not expressly call for: means for electronically steering

Paulraj teaches: means for electronically steering (output of elements are mapped to Spatial Input Filter Input 1 to M and are weighted and summed into d groups per Fig 6 which results in steering and is performed by electronic components)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add means for electronically steering of Paulraj to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 6, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication system of claim 1

The combination of Almouti , Jenness, and Bell do not expressly call for: wherein said multiple element constitute a switched beam antenna

Paulraj teaches: wherein said multiple element constitute a switched beam antenna (output of elements are mapped to Spatial Input Filter Input 1 to M and are weighted and summed into d groups per Fig 6 which results in performing switched beam antenna function)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add wherein said multiple element constitute a switched beam antenna of Paulraj to the system of the

combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 29, Alamouti teaches: in a multi-point communication network (Figure 1 communication network in a multi point configuration) comprising:

A receiver and transmitter at a primary site (Base station which has a TRANS or transmitter and receiver which is at primary site per Fig 1)

A plurality of remote units disposed at second are site for communication with the receiver and the transmitter at said primary site (Plurality of Remote Stations or units at secondary site which communicate with TRANS at Base Station or primary site per Fig 1)

the primary site having an antenna including multiple receiving elements configured for receiving communication over a carrier frequency from the plurality of remote units (Base Station has A & B per Fig 1 are elements which receive communication over F2 or carrier frequency from Remote Station U and Remote Station V respectively)

At least two receiving elements configured to receive the communication signals on the same frequency band during any period of time (A & B per Fig 1 are receiving elements which receive F2 or communication signals on the same frequency band)

Spatial diversity (per Fig 1)

Alamouti does not expressly call for: the receiving elements being partitioned into a plurality of group disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Paulraj teaches: the receiving elements being partitioned into a plurality of group disposed remotely from one another and at lest another group containing multiple elements proximal to one another (Antenna or elements summed and weighted into d groups and each group has at least one antenna weighted per Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the receiving elements being partitioned into a plurality of group disposed remotely from one another Paulraj to the processing of Almouti in order to perform spatial filtering.

The combination of Alamouti and Paulraj does not expressly call for: at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Jenness teaches: disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity (spacing is minimum distance in order to achieve spatial diversity per col. 1 line 63 to col. 2 line 5)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity of Jenness to the system of the combination of Almouti and Paulraj in order to improve signal reception in a multipath environment.

The combination of Alamounti, Paulraj, and Jenness do not expressly call for: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Bell teaches: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity (separating the elements an appropriate or maximum distance in order to achieve spatial diversity per col. 3 line 53 to col. 4 line 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity of Bell to the system of the combination of Alamouti, Paulraj, and Jenness in order to insure that the elements are not separated to far which will result in degradation due to multipath affects.

Referring to claim 30, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication network of claim 29 and predetermined maximum spacing

The combination of Almouti & Paulraj do not expressly call for: spacing no more than one half time a wavelength

Gardner teaches: spacing no more than one half time a wavelength (min per col. 6 line 1 to 27)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add spacing no more than one half time a wavelength of Gardner to the network of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 32, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication network of claim 29

The combination of Almouti Jenness, and Bell do not expressly call for: wherein said multiple elements constitute and adaptive antenna array and each group constitutes a subarray

Paulraj teaches: wherein said multiple elements constitute and adaptive antenna array and each group constitutes a subarray (Antennas 1 through M are elements per Fig 5 and output of elements are mapped to Spatial Input Filter Input 1 to M and are weighted and summed into d groups per Fig 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add wherein said multiple elements constitute and adaptive antenna array and each group constitutes a subarray of Paulraj to the network of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 33, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication network of claim 29

The combination of Almouti, Jenness, and Bell do not expressly call for: means for electronically steering

Paulraj teaches: means for electronically steering (output of elements are mapped to Spatial Input Filter Input 1 to M and are weighted and summed into d groups per Fig 6 which results in steering and is performed by electronic components)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add means for electronically steering of Paulraj to the network of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 34, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication network of claim 29

The combination of Almouti, Jenness, and Bell do not expressly call for: wherein said multiple element constitute a switched beam antenna

Paulraj teaches: wherein said multiple element constitute a switched beam antenna (output of elements are mapped to Spatial Input Filter Input 1 to M and are weighted and summed into d groups per Fig 6 which results in performing switched beam antenna function)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add wherein said multiple element constitute a switched beam antenna of Paulraj to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

4. Claims 2 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti (U.S. Patent No.: 5,933,421) in view of Paulraj (5,345,599) further in view of Jenness (U.S. Patent No.: 5,373,300) in view of Bell (U.S. Patent No.: 6,115,762) further in view of Gardner (U.S. Patent No.: 5,260,968)

Referring to claim 2, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication system of claim 1 and a predetermined receiving element maximum receiving element spacing

The combination of Almouti, Paulraj, Jenness, and Bell do not expressly call for: receiving element spacing no more than one half time a wavelength

Gardner teaches: receiving element spacing no more than one half a wavelength (one half wavelength per col. 6 line 1 to 27)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the receiving element spacing no more than one half time a wavelength of Gardner to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

Referring to claim 30, the combination of Almouti, Paulraj, Jenness, and Bell teach: the network of claim 29 and a predetermined receiving element maximum receiving element spacing

The combination of Almouti, Paulraj, Jenness, and Bell do not expressly call for: receiving element spacing no more than one half time a wavelength

Gardner teaches: receiving element spacing no more than one half a wavelength (one half wavelength per col. 6 line 1 to 27)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the receiving element spacing no more than one half time a wavelength of Gardner to the network of the combination of Almouti, Paulraj, Jenness, and Bell in order to improve performance by improving spatial resolution

5. Claims 3 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti (U.S. Patent No.: 5,933,421) in view of Paulraj (5,345,599) in view of Jenness (U.S. Patent No.: 5,373,300) in view of Bell (U.S. Patent No.: 6,115,762) further in view of Chang (U.S. Patent No.: 5,414,433)

Referring to claim 3, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication system of claim 1 and the predetermined minimum

The combination of Almouti , Paulraj, Jenness, and Bell do not expressly call for: predetermine minimum spacing no more than five time a wavelength

Chang teaches: predetermine minimum spacing no more than five time a wavelength (Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add predetermine minimum spacing no more than five time a wavelength of Chang to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to increase the attenuation at the edge of the bandwidth

Referring to claim 31, the combination of Almouti, Paulraj, Jenness, and Bell teach: the communication network of claim 29 and the predetermined minimum spacing

The combination of Almouti , Paulraj, Jenness , and Bell,and do not expressly call for: predetermine minimum spacing no more than five time a wavelength

Chang teaches: predetermine minimum spacing no more than five time a wavelength (Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add predetermine minimum spacing no more than five time a wavelength of Chang to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to increase the attenuation at the edge of the bandwidth

6. Claims 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti (U.S. Patent No.: 5,933,421) in view of Paulraj (5,345,599) in view of Jenness (U.S. Patent No.: 5,373,300) in view of Bell (U.S. Patent No.: 6,115,762) further in view of Reece (U.S. Patent No.: 5,771,024)

Referring to claim 35, Alamouti teaches: an adaptive antenna array architecture for communication (Figure 1 is the architecture) the architecture comprising:

A plurality of adaptive arrays for signal reception wherein the array is spaced in order to obtain spatial diversity (A, B, C, and D per Fig 1 or plurality of adaptive arrays for signal reception and they are spaced with sufficient geographic separation or spatial diversity per col. 10 line 61)

A base station configured to control the adaptive antenna array structure (Figure 1 shows a base station which controls A, B, C, and D)

The arrays are spaced for spatial diversity (sufficient geographic separation or spatial diversity per col. 10 line 61)

Alamouti does not expressly call for: wherein the plurality of antenna arrays comprise a plurality of sub-arrays, each sub-array including at least two receiving elements the receiving elements in the subarrays being no farther apart than a predetermined maximum element spacing or
an array fixation structure configured to position plurality of adaptive antenna arrays at desired elevation

Paulraj teaches: elements being partitioned into a plurality of groups and each group containing at least one element at least one group including multiple elements located proximate to one another (Antenna or elements summed and weighted into d groups and each group has at least one antenna weighted per Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add elements being partitioned into a plurality of groups and each group containing at least one element at least one group including multiple elements located proximate to one another of Paulraj to the processing of Almouti in order to perform spatial filtering.

The combination of Alamouti and Paulraj does not expressly call for: at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity and an array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation

Jenness teaches: disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity (spacing is minimum distance in order to achieve spatial diversity per col. 1 line 63 to col. 2 line 5)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity of Jenness to the system of the combination of Almouti and Paulraj in order to improve signal reception in a multipath environment.

The combination of Alamounti, Paulraj, and Jenness do not expressly call for: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity and an array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation

Bell teaches: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity (separating the elements an appropriate or maximum distance in order to achieve spatial diversity per col. 3 line 53 to col. 4 line 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one group containing multiple elements no farther apart than a predetermined

maximum receiving element spacing to facilitate spatial diversity of Bell to the system of the combination of Alamouti, Paulraj, and Jenness in order to insure that the elements are not separated to far which will result in degradation due to multipath affects

The combination of Alamouti, Paulraj, Jenness, and Bell do not expressly call for: an array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation

Reeces teaches: An array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation (72 per Fig 6 or array fixation structure and support between 72 and light pole per Fig 6 or array support structure for position array fixation structure at desired elevation

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation of Reece to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to mount the arrays in an environment that does not have a lot of space.

7. Claims 38 & 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paulraj (U.S. Patent No.: 5,345,599) in view of Forssen (U.S. Patent No.: 5,566,209)

Referring to claim 38, Paulraj teaches: signal receiver (Figure 5 or receiver using spatial filter 88 which is shown in more detail in Figure 6) the receiver comprising:

An adaptive array configured to receive signals from remote units (m sub-arrays 72, 74 ,& 76 make up the adaptive array which receive signal from Transmitters or remote units per Fig 5 and per col. 7 line 49 to col. 8 line 49)

A plurality of demodulator units configured to process the signals (There are d demodulators 98 configured to process the signals per Fig 5 and Fig 6 and per col. 7 line 49 to col. 8 line 49)

A plurality of beam formers configured to construct a desired signal response (There are D of the combination of weighting and summing or D beam formers per Fig 6 and per col. 7 line 49 to col. 8 line 49)

A spatial diversity combiner configured to remove interferences from said signal (combiner 98 per Fig 5 inherently remove interference by combining signals per col. 7 line 49 to col. 8 line 49)

Paulraj does not expressly call for: response as a function of direction of arrival data of the signals

Forssen teaches: as a function of direction of arrival data of the signals

(18 per Fig 2 calculates the direction of arrival which is input into the weight function per col. 4 lines 38 to 57)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add as a function of direction of arrival data of the signals of Forssen to the processing of Paulraj in order to improve the spatial processing which will result in improved spatial interference processing.

Referring to claim 39, the combination of Paulraj and Forssen teach the receiver of claim 38

Paulraj does not expressly call for: direction of arrival processor configured to calculate a direction of arrival for the signals

Forssen teaches: direction of arrival processor configured to calculate a direction of arrival for the signals (18 per Fig 2 and per col. 4 lines 38 to 57 or direction of arrival processor)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add direction of arrival processor configured to calculate a direction of arrival for the signals of Forssen to the processing of the combination Paulraj and Forssen in order to improve the spatial processing which will result in improved spatial interference processing.

8. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paulraj (U.S. Patent No.: 5,345,599) in view of Forssen (U.S. Patent No.: 5,566,209) further in view of Alamouti (U.S. Patent No.: 5,933,421)

Referring to claim 40, the combination of Paulraj and Forssen teach: the receiver of claim 38 and and further comprising segmenting available bandwidth into a plurality of frequency bins (segmenting same channel which has a number of frequencies or bins for d signals per col. 7 lines 49 to 52)

The combination of Paulraj and Forseen do not expressly call for: OFDM

Alamouti teaches: OFDM (col. 2 line 65 to col. 3 line 230

It would have been obvious to add OFDM of Almouti in place of the signal of the combination of Paulraj and Forssen (FM per col. 1 line 26 of Paulraj) in order to provide more capacity through the subchannels of OFDM.

9. Claims 41 & 44 are rejected under 35 U.S.C. 103(a) as being unpatentable Ward (U.S. Patent No.: 6,104,930) in view of Langlais (U.S. Patent No.: 6,091,932)

Referring to claim 41, Ward teaches: a method for reducing signal interference (method described per col. 8 lines 1 to 50) the method comprising:

Assigning at least one frequency bin to a user (Assign carrier frequency f1 to MS1 or user while in B7 per col. 8 lines 1 to 50)

spacing the at least one frequency bin belonging to the user to at least one sufficiently different frequency to reduce inter-bin interference (MS1 moves to B6 and another frequency carrier or frequency bin is assigned which is available because no inherent inter-bin interference is present. This occurs because communication over F1 is B6 was lost per col. 8 lines 1 to 50)

locating the at least one frequency bin with at least one frequency bin to other users such that direction of arrival for said user are distinctly separable (Other inherent users are present because the allocation of carrier frequency is based upon frequencies which are underutilized which implies other users are using these carrier frequencies per col. 8 lines 1 to 50)

Ward does not expressly call for: at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference

Langlais teaches: at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference (tones spaced at a given frequency spacing which allows for the tones to be present for a longer period of time or increasing signal strength which reduces inter symbol or inter-bin interference per col. 4 lines 50 to 61)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference of Langlais to the processing of Ward in order to minimize interference.

Referring to claim 44, Ward teaches: a method (Figure 10 performs the method) for avoiding interference in communication signals said method comprising:

Partitioning available bandwidth into a plurality of frequency blocks said frequency blocks comprising a plurality of bins (Bandwidth is divided into carrier frequencies of frequency blocks and each carrier frequency has time slots or bins per col. 10 line 37 to col. 11 line 42)

Assigning as user to a bin in each of said frequency blocks (Carrier frequencies are assigned to users randomly. Slots are assigned based upon availability so a user can be assigned to a first carrier frequency with a slot and a second carrier frequency and another slot per col. 10 line 37 to col. 11 line 42)

Using signal power information to distribute said bins within said frequency blocks (The time slot or bins and carrier frequencies or blocks are available because no signals have been

assigned; therefore signal power is used to as a distribution mechanism per col. 10 line 37 to col. 11 line 42)

Ward does not expressly call for: distributing the bins within the frequency blocks as a function of power of the bins.

Langlais teaches: distributing the bins within the frequency blocks as a function of power of the bins (tones or bins are spaced at a given frequency spacing which allows for the tones to be present for a longer period of time or increasing signal strength which reduces inter symbol or inter-bin interference per col. 4 lines 50 to 61)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add distributing the bins within the frequency blocks as a function of power of the bins of Langlais to the processing of Ward in order to minimize interference.

10. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ward (U.S. Patent No.: 6,104,930).

Referring to claim 43, Ward teaches: a method (Figure 2 performs the method) for allocating communication bandwidth; the method comprising:

The background embodiment teaches: determining the first direction of a signal arrival for a first remote user and a second direction for a second remote user (a plurality of mobiles movement are tracked which would include a first and second mobile user using a narrow angular beam which allows for determination of direction per col. 2 lines 1 to 650

The background embodiment does not expressly call for: assigning the first remote user to a first frequency bin and assigning the second remote user to a second frequency bin based at least in part on the direction of signal arrival such that direction of signal arrival for adjacent frequency bins differs

Another embodiment teaches: assigning the first remote user to a first frequency bin and assigning the second remote user to a second frequency bin based at least in part on the direction of signal arrival such that direction of signal arrival for adjacent frequency bins differs (An assignment of a first inherent remote user is made to B1 with f20. Another or second remote user in B3 is assigned an available frequency which does not include f20 because of interference per col. 11 line 43 to col. 14 line 44)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the assigning said first remote user to a first frequency bin and assigning said second remote user to a second frequency bin based at least in part on said direction of signal arrival such that direction of signal arrival for adjacent frequency bins differs of another embodiment of Ward to

the tracking system of the background embodiment of Ward in order to provide frequency allocation which improves the overall system by making more effective utilization of bandwidth which results in a performance improvement.

Response to Amendment

11. Applicant's arguments filed 7/15/09 have been fully considered but they are not persuasive.

The examiner disagrees with the applicant argument that the combination of references do not teach: in a multi-point communication system having a receiver and transmitter disposed at a primary site for communication with a plurality of remote units disposed at respective secondary sites an antenna comprising: Multiple receiving elements configured to receive communication over a carrier frequency from said plurality of remote units disposed at respective secondary sites ; at least two receiving elements configured to receive the communication signals on the same frequency band during any period of time; the receiving elments being partitition into a plurality of groups disposed remotely from one another by at least a predeteremined minimum group spacing sufficient to obtain spatial diversity, Each group containing at least one receiving element at least one gorup including multiple receiving elemnts located proximal to one another and no farther than a predetermined maxium receiving elment spacing to facilitate spatial filtering.

Alamouti teaches: in a multi-point communication system having a receiver and transmitter disposed at a primary site for communication with a plurality of remote units disposed at respective secondary sites an antenna (Figure 1 shows a Remote stations or units in communication with a Base station which has a TRANS or transmitter and receiver which are in a multi point configuration) comprising:
Multiple receiving elements configured to receive communication over a carrier frequency from said plurality of remote units disposed at respective secondary sites (A & B per Fig 1 are elements which receive communication over F2 or carrier frequency from Remote Station U and Remote Station V which are disposed at respective secondary sites) At least two receiving elements configured to receive the communication signals on the same frequency band during any period of time (A & B per Fig 1 are receiving elements which receive F2 or communication signals on the same frequency band) Each group containing at least one receiving element (A and B contain at least one element per Fig 1) Spatial diversity (per Fig 1)

Alamouti does not expressly call for: the receiving elements being partitioned into a plurality of group disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Paulraj teaches: the receiving elements being partitioned into a plurality of group disposed remotely from one another and at lest another group containing multiple elements proximal to one another (Antenna or elements summed and weighted into d groups and each group has at least one antenna weighted per Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the receiving elements being partitioned into a plurality of group disposed remotely from one another Paulraj to the processing of Almouti in order to perform spatial filtering.

The combination of Alamouti and Paulraj does not expressly call for: at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Jenness teaches: disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity (spacing is minimum distance in order to achieve spatial diversity per col. 1 line 63 to col. 2 line 5)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity of Jenness to the system of the combination of Almouti and Paulraj in order to improve signal reception in a multipath environment.

The combination of Alamounti, Paulraj, and Jenness do not expressly call for: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity

Bell teaches: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity (separating the elements an appropriate or maximum distance in order to achieve spatial diversity per col. 3 line 53 to col. 4 line 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity of Bell to the system of the combination of Alamouti, Paulraj, and Jenness in order to insure that the elements are not separated to far which will result in degradation due to multipath affects.

Next the applicant argues that combination of references do not teach: at least two receiving elements configured to receive the communicaitn signal on a same frequency band any period of time, the receivng elements being partioned in two groups.
Almouti teaches: at least two elments configured to receive communication signals on a same frequency band any period of time (A and B per Fig 1 are at least two elements configured to receive communication signals on a same frequency band during any period of time. A and B

are two separate groups) Next the applicant argues that the combination does not expressly call for: at least one group including multiple receiving elments located proximal to one another and no farther apart than a predetermined maximum receiving elment spacing to facilitate spatial filtering Bell teaches: at least one group including multiple receiving elments located proximal to one another and no farther apart than a predetermined maximum receiving elment spacing to facilitate spatial filtering (separating the elments an appropriate or maximum distance in order to achieve spatial diversitnty per col. 3 lines 53 to col. 4 line 6)

Next the applicant goes through a piece meal analysis by describing literally what each reference Paulraj , Jennesses and Bell into a hypothenical system which applicant claims would not have "pluralitiy of groups" , "multiple receiving elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing.. The examiner previously described how all of these elements clearly fitted to together into a rejection with all of the combination of reference and an appropriate motivation to combine.
Next the applicant goes on to argue that the no one of ordinary skill would combine the reference to perform the claimed limtations. The examiner has explained in the above rejection how all of the limitations fit together and appropriate reason to combine. The applicant failed to produce any evidence in any of the reference why it would not be appropriate to combine the references.

Relative to claims 2 and 30 the applicant again repeats the same argument relative to why the combination of reference do not teach the claimed invention. For brevity reasons the examiner will not repeat the response which can be read above. Additionally the applicant claims that none of the reference teach: receiving element spacing no more than one half time a wavelength. Gardnet teachesL receiving elment spacing no more than one half a wavelength (one half savelength per col. 6 lines 1-27)

Relative to claims 3 and 31 the applicant again repeats the same argument relative to why the combination of references do not tehac the claimed invention. For brevity reasons the examienr will not repeat the response which can be read above. Additionally the applciant claims that none of the refences teach: prdetermined minimum spacing no more than give time a wavelength. Chang teaches: prdetermined minimum spacing no more than five times a wavelength (Fig 6)

Referring to claim 35. the examiner respectfully disagrees with the applicant argument that the combination of references do not teach: an adaptive antenna array architecture for communiciaotn, the architecture comprising: a plurality of adaptive antenna arrays for signal reception, wherein the plurality of adaptive antenna arrays inclduing a plurality of sub-arrays each subarray including at least two receiving elments the receiving elments in the sub-array being no farther apart than a predtermeind maxium receiving elment spacing to facilitate spatial filtering wherien the sub-arrays being spaced to obtain spatial diversity; an array fixation strucutre configured to position the plurality of adaptive antenna arrays; an array support strucutre for positioning the array fixation structure at a desired elevation and a base station configured to control the adaptive antenna array architecture.

Alamouti teaches: an adaptive antenna array architecture for communication (Figure 1 is the architecture) the architecture comprising:

A plurality of adaptive arrays for signal reception wherein the array is spaced in order to obtain spatial diversity (A, B, C, and D per Fig 1 or plurality of adaptive arrays for signal reception and they are spaced with sufficient geographic separation or spatial diversity per col. 10 line 61)

A base station configured to control the adaptive antenna array structure (Figure 1 shows a base station which controls A, B, C, and D)

The arrays are spaced for spatial diversity (sufficient geographic separation or spatial diversity per col. 10 line 61)

Alamouti does not expressly call for: wherein the plurality of antenna arrays comprise a plurality of sub-arrays, each sub-array including at least two receiving elements the receiving elements in the subarrays being no farther apart than a predetermined maximum element spacing or an array fixation structure configured to position plurality of adaptive antenna arrays at desired elevation

Paulraj teaches: elements being partitioned into a plurality of groups and each group containing at least one element at least one group including multiple elements located proximate to one another (Antenna or elements summed and weighted into d groups and each group has at least one antenna weighted per Figure 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add elements being partitioned into a plurality of groups and each group containing at least one element at least one group including multiple elements located proximate to one another of Paulraj to the processing of Almouti in order to perform spatial filtering.

The combination of Alamouti and Paulraj does not expressly call for: at least a predetermined minimum group spacing sufficient to obtain spatial diversity; at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity and an array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation

Jenness teaches: disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity (spacing is minimum distance in order to achieve spatial diversity per col. 1 line 63 to col. 2 line 5)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity of Jenness to the system of the combination of Almouti and Paulraj in order to improve signal reception in a multipath environment.

The combination of Alamounti, Paulraj, and Jenness do not expressly call for: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity and an array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation

Bell teaches: at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity (separating the elements an appropriate or maximum distance in order to achieve spatial diversity per col. 3 line 53 to col. 4 line 6)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one group containing multiple elements no farther apart than a predetermined maximum receiving element spacing to facilitate spatial diversity of Bell to the system of the combination of Alamouti, Paulraj, and Jenness in order to insure that the elements are not separated to far which will result in degradation due to multipath affects

The combination of Alamouti, Paulraj, Jenness, and Bell do not expressly call for: an array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation

Reeces teaches: An array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation (72 per Fig 6 or array fixation structure and support between 72 and light pole per Fig 6 or array support structure for position array fixation structure at desired elevation

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the array fixation structure for mounting said plurality of adaptive antenna arrays at desired elevation of Reece to the system of the combination of Almouti, Paulraj, Jenness, and Bell in order to mount the arrays in an environment that does not have a lot of space.

Next the applicant goes through a piece meal analysis by describing literally what each reference Paulraj , Jennesses and Bell into a hypothenical system which applicant claims would not have "pluralitiy of groups" , "multiple receiving elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing.. The examiner previously described how all of these elements clearly fitted to together into a rejection with all of the combination of reference and an appropriate motivation to combine.
Next the applicant goes on to argue that the no one of ordinary skill would combine the reference to perform the claimed limtations. The examiner has explained in the above rejection how all of the limitations fit together and appropriate reason to combine. The applicant failed to produce any evidence in any of the reference why it would not be appropriate to combine the references. The examiner respects applicant opinion however, applicant has a burden to provide evidence and applicant opinion is not evidence.

The examiner respectfully disagrees with the applicant argument relative to claim 38that the combination of reference do not teach: a signal receiver for receving communication signals the receiver comprising: an adaptive array configured to receive signals form remot eunits; a

plurality of demodulator units configured to process the signals; a plurality of beam former for configuring to construct a desired signal response as a function of direction of arriva data of the signals ; and a spatial diversity combiner configured to remove interference from the signals.

Referring to claim 38, Paulraj teaches: signal receiver (Figure 5 or receiver using spatial filter 88 which is shown in more detail in Figure 6) the receiver comprising:

An adaptive array configured to receive signals from remote units (m sub-arrays 72, 74 ,& 76 make up the adaptive array which receive signal from Transmitters or remote units per Fig 5 and per col. 7 line 49 to col. 8 line 49)

A plurality of demodulator units configured to process the signals (There are d demodulators 98 configured to process the signals per Fig 5 and Fig 6 and per col. 7 line 49 to col. 8 line 49)

A plurality of beam formers configured to construct a desired signal response (There are D of the combination of weighting and summing or D beam formers per Fig 6 and per col. 7 line 49 to col. 8 line 49)

A spatial diversity combiner configured to remove interferences from said signal (combiner 98 per Fig 5 inherently remove interference by combining signals per col. 7 line 49 to col. 8 line 49)

Paulraj does not expressly call for: response as a function of direction of arrival data of the signals

Forssen teaches: as a function of direction of arrival data of the signals
(18 per Fig 2 calculates the direction of arrival which is input into the weight function per col. 4 lines 38 to 57)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add as a function of direction of arrival data of the signals of Forssen to the processing of Paulraj in order to improve the spatial processing which will result in improved spatial interference processing.

Referring to claim 39, the combination of Paulraj and Forssen teach the receiver of claim 38

Paulraj does not expressly call for: direction of arrival processor configured to calculate a direction of arrival for the signals

Forssen teaches: direction of arrival processor configured to calculate a direction of arrival for the signals (18 per Fig 2 and per col. 4 lines 38 to 57 or direction of arrival processor)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add direction of arrival processor configured to calculate a direction of arrival for the signals of

Forssen to the processing of the combination Paulraj and Forssen in order to improve the spatial processing which will result in improved spatial interference processing.

Next the applicant goes through a piece meal analysis by describing literally what each reference Paulraj , Jennesses and Bell into a hypothenical system which applicant claims would not have "pluralitiy of groups" , "multiple receiving elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing.. The examiner previously described how all of these elements clearly fitted to together into a rejection with all of the combination of reference and an appropriate motivation to combine.
Next the applicant goes on to argue that the no one of ordinary skill would combine the reference to perform the claimed limtations. The examiner has explained in the above rejection how all of the limitations fit together and appropriate reason to combine. The applicant failed to produce any evidence in any of the reference why it would not be appropriate to combine the references. The examiner respects applicant opinion however, applicant has a burden to provide evidence and applicant opinion is not evidence.

Referring to claim 40 the applicant again argues for the same reason that claim 38 is allowable that 40 should be allowable, The examiner has already addressed these issues refer to the above for details.

The examiner respectfully disagrees with the applicant argument that the combination of references do not teach: a emthod for reducing signal interference, the method comprising assigning at least one frequency bin to a user; spacing the at least one frequency bin belonging to the user to at least one sufficiently different frequency as a function of minimizing singal strength of active gins to reduct inter-bin interference; and locating the at lest one frequency bin with at least one frequency bin of other user such that direction of arrival for the user are distinctly separable

Referring to claim 41, Ward teaches: a method for reducing signal interference (method described per col. 8 lines 1 to 50) the method comprising:

Assigning at least one frequency bin to a user (Assign carrier frequency f1 to MS1 or user while in B7 per col. 8 lines 1 to 50)

spacing the at least one frequency bin belonging to the user to at least one sufficiently different frequency to reduce inter-bin interference (MS1 moves to B6 and another frequency carrier or frequency bin is assigned which is available because no inherent inter-bin interference is present. This occurs because communication over F1 is B6 was lost per col. 8 lines 1 to 50)

locating the at least one frequency bin with at least one frequency bin to other users such that direction of arrival for said user are distinctly separable (Other inherent users are present because the allocation of carrier frequency is based upon frequencies which are underutilized which implies other users are using these carrier frequencies per col. 8 lines 1 to 50)

Ward does not expressly call for: at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference

Langlais teaches: at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference (tones spaced at a given frequency spacing which allows for the tones to be present for a longer period of time or increasing signal strength which reduces inter symbol or inter-bin interference per col. 4 lines 50 to 61)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference of Langlais to the processing of Ward in order to minimize interference.

Next the applicant goes through a piece meal analysis by describing literally what each reference Ward and Langlais into a hypothenical system which applicant claims would not have "the at least one of frequency bin belonging to the user to at least one sufficiently different frequency as a funciton of minimizing signal strehgth of active bins to reduct inter-bin interference. The examiner previously described how all of these elements clearly fitted to together into a rejection with all of the combination of reference and an appropriate motivation to combine.
Next the applicant goes on to argue that the no one of ordinary skill would combine the reference to perform the claimed limtations. The examiner has explained in the above rejection how all of the limitations fit together and appropriate reason to combine. The applicant failed to produce any evidence in any of the reference why it would not be appropriate to combine the references. The examiner respects applicant opinion however, applicant has a burden to provide evidence and applicant opinion is not evidence.

The examiner respectfully disagrees with the applicant argument relative to claim 43 that the Ward does not teach: a method of avoiding interference in communicaiont signals the method comprising: partition available bandwidht into a plurlaity of frequency blocks the frequency blocks including a plurality of gins; assigning a user to a bin in each of the frequency blocks and distribuit the bins within the frequency blocks as a function of the power in the bins.

Referring to claim 43, Ward teaches: a method (Figure 2 performs the method) for allocating communication bandwidth; the method comprising:

The background embodiment teaches: determining the first direction of a signal arrival for a first remote user and a second direction for a second remote user (a plurality of mobiles movement are tracked which would include a first and second mobile user using a narrow angular beam which allows for determination of direction per col. 2 lines 1 to 650

The background embodiment does not expressly call for: assigning the first remote user to a first frequency bin and assigning the second remote user to a second frequency bin based at least in part on the direction of signal arrival such that direction of signal arrival for adjacent frequency bins differs

Another embodiment teaches: assigning the first remote user to a first frequency bin and assigning the second remote user to a second frequency bin based at least in part on the direction of signal arrival such that direction of signal arrival for adjacent frequency bins differs (An assignment of a first inherent remote user is made to B1 with f20. Another or second remote user in B3 is assigned an available frequency which does not include f20 because of interference per col. 11 line 43 to col. 14 line 44)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the assigning said first remote user to a first frequency bin and assigning said second remote user to a second frequency bin based at least in part on said direction of signal arrival such that direction of signal arrival for adjacent frequency bins differs of another embodiment of Ward to the tracking system of the background embodiment of Ward in order to provide frequency allocation which improves the overall system by making more effective utilization of bandwidth which results in a performance improvement.

The examiner respectfully disagrees with the applicant argument relative to claim 44 that the combination of reference do not teach: a method of avoiding interference in communicaiont signals the method comprising: partition available bandwidht into a plurlaity of frequency blocks the frequency blocks including a plurality of gins; assigning a user to a bin in each of the frequency blocks and distribuit the bins within the frequency blocks as a function of the power in the bins.

Referring to claim 44, Ward teaches: a method (Figure 10 performs the method) for avoiding interference in communication signals said method comprising:

Partitioning available bandwidth into a plurality of frequency blocks said frequency blocks comprising a plurality of bins (Bandwidth is divided into carrier frequencies of frequency blocks and each carrier frequency has time slots or bins per col. 10 line 37 to col. 11 line 42)

Assigning as user to a bin in each of said frequency blocks (Carrier frequencies are assigned to users randomly. Slots are assigned based upon availability so a user can be assigned to a first carrier frequency with a slot and a second carrier frequency and another slot per col. 10 line 37 to col. 11 line 42)

Using signal power information to distribute said bins within said frequency blocks (The time slot or bins and carrier frequencies or blocks are available because no signals have been assigned; therefore signal power is used to as a distribution mechanism per col. 10 line 37 to col. 11 line 42)

Ward does not expressly call for: distributing the bins within the frequency blocks as a function of power of the bins.

Langlais teaches: distributing the bins within the frequency blocks as a function of power of the bins (tones or bins are spaced at a given frequency spacing which allows for the tones to be present for a longer period of time or increasing signal strength which reduces inter symbol or inter-bin interference per col. 4 lines 50 to 61)

It would have been obvious to one of ordinary skill in the art at the time of the invention to add distributing the bins within the frequency blocks as a function of power of the bins of Langlais to the processing of Ward in order to minimize interference.

Next the applicant goes through a piece meal analysis by describing literally what each reference Ward and Langlais into a hypothenical system which applicant claims would not have "prevented intersymbol interfere but without employing a combinter that distributes the bins with the frequenct blocks as a function of power. The examiner previously described how all of these elements clearly fitted to together into a rejection with all of the combination of reference and an appropriate motivation to combine.
Next the applicant goes on to argue that the no one of ordinary skill would combine the reference to perform the claimed limtations. The examiner has explained in the above rejection how all of the limitations fit together and appropriate reason to combine. The applicant failed to produce any evidence in any of the reference why it would not be appropriate to combine the references. The examiner respects applicant opinion however, applicant has a burden to provide evidence and applicant opinion is not evidence.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT W. WILSON whose telephone number is (571)272-3075. The examiner can normally be reached on M-F (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dang Ton can be reached on 571/272-3171. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert W Wilson/
Primary Examiner, Art Unit 2475

RWW
10/9/09